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PATENT & TRADEMARK OFFICE

PATENT
Atty Docket No. KLAC0075

I HEREBY CERTIFY THAT ON OCTOBER 8, 2007, THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO: MAIL STOP APPEAL BRIEF – PATENTS, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450.

STEVEN W. SMYRSKI

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Group Art Unit: 2872
YUNG-HO CHUANG, ET AL.	Examiner: Lee A. Fineman
Title: INSPECTION SYSTEM USING SMALL CATADIOPTRIC OBJECTIVE	
Serial No.: 10/615,512	
Filed: July 7, 2003	

APPELLANTS' BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from the final rejection of the Examiner dated May 1, 2007 in the above-referenced application.

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1. Real Party in Interest

The real party in interest is KLA-Tencor Technologies Corporation, a corporation of California, USA, and an assignment of the application to KLA-Tencor Technologies Corporation is recorded at the United States Patent and Trademark Office at Reel 014908, Frame 0183.

2. Related Appeals and Interferences

There are no related appeals or interferences known to the Appellants.

3. Status of the Claims

Claims 1, 2, 5, 9, 70, and 75-91 stand finally rejected and are subject of this appeal. A complete listing of the claims as pending is reproduced in the Appendix.

The final rejection of claims 1, 2, 5, 9, 70, and 75-91 is the subject of this appeal.

4. Status of Amendments

No amendments were filed after the final rejection.

5. Summary of Claimed Subject Matter

The present invention is directed to objectives. From the specification, the inspection system and designs disclosed employ an imaging subsystem having generally small size, in particular a small sized objective design, that provides advantages over previous catadioptric designs. [Specification, p. 7, ll. 2-6] The present inspection system includes various components and subsystems that may be employed in accordance with a relatively small objective to provide accurate and high quality scans as compared with previously known systems employing relatively small objectives. [Specification, p. 7, ll. 6-11].

System components emit illumination from illumination subsystem toward a specimen, typically maintained and possibly moved using positioning stage, whereby light

energy passes to the relatively small dimensioned objective, imaging optics, or other imaging components in the imaging subsystem and to sensor subsystem. [FIG. 1A; Specification, p. 16, ll. 1-8] Data is acquired from the sensor or sensor subsystem using a data acquisition subsystem, which may interact with the sensor subsystem to more accurately sense data received, either via positioning, focus, or in some other manner. [Specification, p. 16, ll. 8-13] Data acquired may be analyzed using data analysis subsystem, which may include, for example, databases having appearance of known specimens and/or specimen defects. [Specification, p. 16, ll. 13-16] Data analysis information may be fed back to the data acquisition subsystem, to for example reacquire data, and may be provided to positioning stage to reposition the specimen. [Specification, p. 16, ll. 16-20] The data acquisition subsystem may also interact with the illumination subsystem to alter illumination characteristics depending on the quality of image received. [Specification, p. 16, ll. 20-23] Finally, autofocus subsystem may be employed with a positioning stage to automatically focus the specimen. [Specification, p. 16, ll. 23-25]

Operation of various subsystems employed with the objective and various aspects of the design are disclosed, including the inspection modes employed [Specification, p. 16 et seq.], illumination employed [Specification, p. 21 et seq.], optical components including collection optics [Specification, p. 25 et seq.], positioning subsystems/devices [Specification, pp. 40-41], imaging aspects [Specification, p. 42 et seq.], autofocus [Specification, pp. 79-82], sensor [Specification, pp. 82-86], data acquisition hardware/subsystems [Specification, pp 86 et seq.] Objective designs as presented in the present application use a single glass material with lenses having maximum diameters from around 20 mm up to 100 mm. [Specification, p. 70, ll. 9-12].

Regarding individual claims, independent claim 1 recites:

A system for inspecting a specimen, comprising:

an illumination system comprising an arc lamp able to provide light energy having a wavelength in the range of less than approximately 320 nanometers; and

an imaging subsystem oriented and configured to receive said light energy from said illumination system and direct light energy toward said specimen, said imaging subsystem comprising a plurality of elements all aligned along a single axis, each element having diameter less than approximately 100 millimeters, wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90 for the light energy received from the illumination system having the wavelength in the range of less than approximately 320 nanometers.

In this regard, examples in the specification are disclosed from page 15 to page 90 and at FIG. 1A to FIG. 31. The exemplary embodiments disclose a system for inspecting a specimen [Specification, p. 15, ll. 1-11; FIG. 1A; Specification, p. 15, l. 12 – p. 16, l. 25; various other examples throughout the Specification]; an illumination system [Specification, p. 21, ll. 1-12; FIGs. 1B, 1C, 1D] comprising an arc lamp [FIG. 1C; Specification, p. 21, l. 20; p. 22, ll. 15-20; p. 22, l. 29 – p. 29, l. 16] able to provide light energy having a wavelength in the range of less than approximately 320 nanometers ["arc lamp" entries in the table at Specification, p. 24, after l. 15; see also, originally filed claim 1; p. 48, ll. 1-3 "lamp spectral bands from 192-194, 210-216, 230-254, 285-320, and 365-546nm"]. Further, exemplary embodiments in the specification disclose an imaging subsystem [Specification, p. 42, l. 1 et seq.; FIGs. 16, 17, and 26-29] oriented and configured to receive said light energy from said illumination system [FIG. 14; imaging system 1402; Specification, p. 42, ll. 12-19, including discussion of illuminator 1406; FIG. 1A; FIGs. 16 and 17] and direct light energy toward said specimen [FIG. 14; imaging system 1402; "sample" 1401; FIGs. 16, 17, and 26-29 and, e.g., discussion at Specification, pp. 43-54 (including recitation of "sample" 1600, not shown); Specification, p. 42, ll. 12-19; FIG. 1A], said imaging subsystem comprising a plurality of elements all aligned along a single axis [FIGs. 16, 17, and 26-29], each element having diameter less than approximately 100 millimeters [FIGs. 16, 17, and 26-29; diameters listed in Tables at Specification, pp. 45-46 (FIG. 16 embodiment) and pp. 53-54 (FIG. 17 embodiment); Specification, p. 70, ll. 9-12], wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters [FIG. 31; Specification,

p. 71, ll. 3-25; FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 10-15] at a numerical aperture of approximately 0.90 [FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 19-20] for the light energy received from the illumination system having the wavelength in the range of less than approximately 320 nanometers ["arc lamp" entries in the table at Specification, p. 24, after l. 15; see also, originally filed claim 1; p. 48, ll. 1-3 "lamp spectral bands from 192-194, 210-216, 230-254, 285-320, and 365-546nm"].

Independent claim 75 recites:

A system for inspecting a specimen, comprising:

an illumination system able to provide light energy having a wavelength within a predetermined range; and

an imaging subsystem oriented and configured to receive said light energy from said illumination system and direct light energy toward said specimen, said imaging subsystem comprising a plurality of optical elements all aligned along an axis and each having maximum diameter less than approximately 100 millimeters, wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90.

In this regard, examples in the specification are disclosed from page 15 to page 90 and at FIG. 1A to FIG. 31. The exemplary embodiments disclose a system for inspecting a specimen [Specification, p. 15, ll. 1-11; FIG. 1A; Specification, p. 15, l. 12 – p. 16, l. 25; various other examples throughout the Specification]; an illumination system [Specification, p. 21, ll. 1-12; FIGs. 1B, 1C, 1D] able to provide light energy having a wavelength within a predetermined range [Specification, p. 20, l. 1 – p. 24, l. 22; see specifically, entries in the table at Specification, p. 24, after l. 15; see also, e.g., p. 46, l. 20 – p. 48, l. 12]. Further, exemplary embodiments in the specification disclose an imaging subsystem [Specification, p. 42, l. 1 et seq. FIGs. 16, 17, and 26-29] oriented and configured to receive said light energy from said illumination system [FIG. 14; imaging

system 1402; Specification, p. 42, ll. 12-19, including discussion of illuminator 1406; FIG. 1A; FIGs. 16, 17, and 26-29] and direct light energy toward said specimen [FIG. 14; imaging system 1402; "sample" 1401; FIGs. 16, 17, and 26-29 and, e.g., discussion at Specification, pp. 43-54 (including recitation of "sample" 1600, not shown); Specification, p. 42, ll. 12-19; FIG. 1A], said imaging subsystem comprising a plurality of optical elements all aligned along an axis [FIGs. 16, 17, and 26-29] and each having maximum diameter less than approximately 100 millimeters [FIGs. 16, 17, and 26-29; diameters listed in Tables at Specification, pp. 45-46 (FIG. 16 embodiment) and pp. 53-54 (FIG. 17 embodiment); Specification, p. 70, ll. 9-12], wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters [FIG. 31; Specification, p. 71, ll. 3-25; FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 10-15] at a numerical aperture of approximately 0.90 [FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 19-20].

Independent claim 83 recites:

A system for inspecting a specimen, comprising:

an illumination system able to provide light energy having a wavelength within a predetermined range; and

an imaging subsystem configured to receive said light energy and direct light energy toward said specimen using a plurality of elements having a maximum diameter less than approximately 100 millimeters, said plurality of elements being free of planar reflecting surfaces, wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90.

In this regard, examples in the specification are disclosed from page 15 to page 90 and at FIG. 1A to FIG. 31. The exemplary embodiments disclose a system for inspecting a specimen [Specification, p. 15, ll. 1-11; FIG. 1A; FIGs. 16, 17, and 26-29; Specification, p. 15, l. 12 – p. 16, l. 25; various other examples throughout the Specification]; an illumination system [Specification, p. 21, ll. 1-12; FIGs. 1B, 1C, 1D]

able to provide light energy having a wavelength within a predetermined range [Specification, p. 20, l. 1 – p. 24, l. 22; see specifically, entries in the table at Specification, p. 24, after l. 15; see also, e.g., p. 46, l. 20 – p. 48, l. 12]. Further, exemplary embodiments in the specification disclose an imaging subsystem [Specification, p. 42, l. 1 et seq.; FIGs. 16, 17, and 26-29] configured to receive said light energy [FIG. 14; imaging system 1402; Specification, p. 42, ll. 12-19, including discussion of illuminator 1406; FIG. 1A; FIGs. 16 and 17] and direct light energy toward said specimen [FIG. 14; imaging system 1402; "sample" 1401; FIGs. 16, 17 and 26-29 and associated discussion at, e.g., Specification, pp. 43-54 (including recitation of "sample" 1600, not shown); Specification, p. 42, ll. 12-19; FIG. 1A] using a plurality of elements having a maximum diameter less than approximately 100 millimeters [FIGs. 16, 17, and 26-29; diameters listed in Tables at Specification, pp. 45-46 (FIG. 16 embodiment) and pp. 53-54 (FIG. 17 embodiment); Specification, p. 70, ll. 9-12], said plurality of elements being free of planar reflecting surfaces [FIGs. 16, 17, and 26-29], wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters [FIG. 31; Specification, p. 71, ll. 3-25; FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 10-15] at a numerical aperture of approximately 0.90 [FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 19-20].

Independent claim 86 recites:

A method for inspecting a specimen, comprising:

providing light energy having a wavelength within a predetermined range; and

receiving said light energy and directing light energy toward said specimen using a plurality of optical elements aligned collectively along a single axis, each optical element having maximum diameter less than approximately 100 millimeters, wherein the optical elements are configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90.

In this regard, examples in the specification are disclosed from page 15 to page 90 and at FIG. 1A to FIG. 31. The exemplary embodiments disclose a method for inspecting a specimen [Specification, p. 15, ll. 1-11; FIG. 1A; FIGs. 16, 17, and 26-29; Specification, p. 15, l. 12 – p. 16, l. 25; various other examples throughout the Specification]; providing light energy having a wavelength within a predetermined range [Specification, p. 21, ll. 1-12; FIGs. 1B, 1C, 1D; Specification, p. 20, l. 1 – p. 24, l. 22; see specifically, entries in the table at Specification, p. 24, after l. 15; see also, e.g., p. 46, l. 20 – p. 48, l. 12]. Further, exemplary embodiments in the specification disclose receiving said light energy [FIG. 14; imaging system 1402; Specification, p. 42, ll. 12-19, including discussion of illuminator 1406; FIG. 1A; FIGs. 16 and 17] and directing light energy toward said specimen [FIG. 14; imaging system 1402; "sample" 1401; FIGs. 16, 17 and 26-29 and associated discussion at, e.g., Specification, pp. 43-54 (including recitation of "sample" 1600, not shown); Specification, p. 42, ll. 12-19; FIG. 1A] using a plurality of optical elements aligned collectively along a single axis [FIGs. 16, 17, and 26-29], each optical element having maximum diameter less than approximately 100 millimeters [FIGs. 16, 17, and 26-29; diameters listed in Tables at Specification, pp. 45-46 (FIG. 16 embodiment) and pp. 53-54 (FIG. 17 embodiment); Specification, p. 70, ll. 9-12], wherein the optical elements are configured to provide a field size in excess of approximately 0.4 millimeters [FIG. 31; Specification, p. 71, ll. 3-25; FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 10-15] at a numerical aperture of approximately 0.90 [FIGs. 16, 17, and 26-29; Specification, p. 48, ll. 20-24; p. 52, ll. 19-20].

6. Grounds of Rejection to be Reviewed on Appeal

1. Rejection of claims 75, 79-81, 83, 86 and 90 under 35 U.S.C. § 102(b) as being anticipated by Chuang et al. U.S. Patent 6,064,517 ("Chuang") and rejection of dependent claims 76 and 87 under 35 U.S.C. §103(a) as being unpatentable over Chuang.

2. Rejection of claims 1, 6-9, 82, 85, and 91 under 35 U.S.C. § 103(a) as being unpatentable over Chuang in view of Shafer et al., U.S. Patent 5,717,518 ("Shafer").

3. Rejection of claims 1, 2, 5, 70, 75-78, 83, 84, and 86-89 under 35 U.S.C. § 103(a) as being unpatentable over Liang, U.S. Patent Publication 2004/0051957 ("Liang") in view of Shafer, U.S. 2001/0040722 ("Shafer '722").

7. Argument

A. Claims 75, 76, 79-81, 83, 86, 87, and 90 are Patentable Over Chuang

The Office Action rejected claims 75, 79-81, 83, 86 and 90 under 35 U.S.C. § 102(b) based on Chuang et al. U.S. Patent 6,064,517 ("Chuang"). The Office Action also rejected claims 76 and 87 under 35 U.S.C. §103 based on Chuang.

The Office Action relies on FIG. 17 of Chuang to reject the present claims. Chuang does not include a design wherein the salient elements are each less than 100 millimeters in diameter as required by the express language of claim 75. Regarding the claim phrase "imaging subsystem" as used in claim 75, Appellants note that while FIG. 17 of Chuang does disclose a system comprising a catadioptric group 1701 and focusing group 1702, the Office Action solely focuses on the focusing group 1702 as allegedly forming the claimed "imaging subsystem." Appellants submit that the imaging subsystem as claimed is broader than simply the focusing group 1702 of Chuang, as the imaging subsystem is said to be "configured to receive said light energy from said illumination system <u>and direct light energy toward said specimen</u>..." This is more than merely the lensing arrangement but also, based on the requirement to "direct light energy toward said specimen," <u>specifically includes the Mangin mirror element 1706 in catadioptric group 1701</u>. Appellants note that in the present application, FIG. 27, for example, is said to be "an approximately 0.28 mm field design having approximately 26 mm diameter" which includes a mangin mirror element, demonstrating an example of "an imaging subsystem... comprising a plurality of optical elements ... each having maximum diameter less than approximately 100 millimeters." Other examples of imaging subsystems having limited diameters, namely diameters under the claimed 100 millimeters, are presented throughout the specification.

The Office Action addresses this by pointing to the reference values, such as the 30 mm reference shown in the upper left corner of FIG. 17 of Chuang, presented in each Figure of Chuang and stating that "the diameter of the largest <u>lens</u> (1712) is approximately 50 mm..." Final Office Action, pp. 2-3 (emphasis added). Again, the imaging susbsystem as claimed is not solely limited to the lenses disclosed but includes catadioptric elements, such

as dome shaped reflector 1706 in catadioptric group 1701 of FIG. 17 of Chuang. The Final Office Action also attempts to employ the word "comprising" as somehow justifying exclusion of dome shaped reflector 1706 from the "imaging subsystem," insisting that the "imaging subsystem" only encompasses focusing lenses in focusing group 1702. (Final Office Action, p. 7). The term "comprising" has no bearing here such that catadioptric group 1702 of Chuang could be ignored – as noted, the imaging subsystem is said to "receive said light energy from said illumination system <u>and direct light energy toward said specimen,</u>" functions performed by the catadioptric group 1701 of Chuang, which includes dome shaped reflector 1706 having diameter greater than 100 millimeters.

Appellants submit therefore that taking the entirety of FIG. 17 of Chuang into account, the imaging subsystem, to the extent one is present in Chuang, would be interpreted to include catadioptric element (or dome shaped reflector) 1706, which is over 100 millimeters in diameter. Thus Chuang does not anticipate claim 75 ("said imaging subsystem comprising a plurality of optical elements all aligned along an axis and each having maximum diameter less than approximately 100 millimeters") or claim 83 ("an imaging subsystem configured to receive said light energy and direct light energy toward said specimen using a plurality of elements having a maximum diameter less than approximately 100 millimeters") or claim 86 ("directing light energy toward said specimen using a plurality of optical elements aligned collectively along a single axis, each optical element having maximum diameter less than approximately 100 millimeters") or claims dependent therefrom, nor does Chuang render dependent claims 76 and 87 obvious as they include limitations not present in Chuang. Thus Claims 75, 76, 79-81, 83, 86, 87, and 90 are allowable based on Chuang.

<u>B. Claims 1, 6-9, 82, 85, and 91 are Patentable Over Chuang in view of Shafer</u>

The Office Action rejected claims 1, 6-9, 82, 85, and 91 under 35 U.S.C. § 103(a) based on Chuang in view of Shafer et al., U.S. Patent 5,717,518 ("Shafer"). Claim 1 is independent and all others are dependent.

Regarding independent claim 1, the Office Action relies on Shafer for the "illumination system [comprising] an arc lamp having a wavelength in the range of less than approximately 320 nanometers." Office Action, p. 4. The remainder of the claim is purportedly shown by Chuang. However, as noted above, Chuang does not include a design wherein the salient elements are each less than 100 millimeters in diameter as required by the express language of claim 1 ("said imaging subsystem comprising a plurality of elements all aligned along a single axis, each element having diameter less than approximately 100 millimeters"). The FIG. 17 embodiment of Chuang shows a catadioptric element 1706 that exceeds this value in addition to the lenses relied on in rejecting the claim. The fact that catadioptric or dome shaped reflector 1706 has a diameter in excess of 100 millimeters indicates claim 1 is not obvious based on Chuang in view of Shafer.

Further, Applicant disputes the contention that the present design is obvious in view of Chuang in combination with Shafer. Regarding the combination of Chuang and Shafer, the Final Office Action makes general arguments about what the Chuang and Shafer references teach, which are then implicitly applied to the rejected independent claims. However, the Final Office Action fails to make a prima facie case for obviousness because there is no logical reasoning to combine these references in the manner done in the present Final Office Action.

The standard for making an obviousness rejection is currently set forth in MPEP 706.02(j):

> To establish a *prima facie* case of obviousness, *three basic criteria must be met*. **First**, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. **Second**, there must be a reasonable expectation of success. **Finally**, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The ***teaching or suggestion*** to make the claimed combination **and** the ***reasonable expectation of success*** **must** ***both be found in the prior art,*** **and not** ***based on applicant's disclosure***. (emphasis and formatting

> added) MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)
>
> The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a ***convincing line of reasoning*** as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). (emphasis added).

See also, KSR International Co. v. Teleflex Inc., No. 04-1350, 550 U.S. ___ (2007).

The Final Office Action fails to meet this burden. Although the Final Office Action tries to describe how one skilled in the art would have been motivated to modify the Chuang objective to employ light energy of different wavelengths, such as energy from an arc lamp, as shown in Shafer and make a functional or useful objective, these attempts have fallen short.

For example, the Final Office Action states:

> It would have been obvious to one of ordinary skill in the art at the time the invention was [made to] make the wavelength of the illumination system any wavelength from the infrared to the ultraviolet, which includes the claimed range, to be able to examine different specimen characteristics under different light conditions. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the illumination system of Chuang with an arc lamp as suggested by [Shafer], because it is a reliable, commonly available light source.

(Final Office Action, pp. 4-5).

Appellants make a few points here. First, the combination here is a combination of the Chuang objective, such as that shown in FIG. 17, with an arc lamp discussed in Shafer. As noted above, Chuang is missing the 100 millimeter limitation, as is Shafer, and thus any combination cannot be said to show the claimed invention, as a material

limitation is missing even in the presence of such a combination. Second, simply plugging in an arc lamp into the Chuang design may not produce the benefits claimed. One simply cannot take elements from one design and use them in another design and expect the mixed-and-matched combination to work under all scenarios. Third, the fact that arc lamps are commonly available is not a reason to wholesale incorporate such a device with the Chuang objective – this is an end result gleaned from Appellant's claims, put forward to support a combination that has no suggestion or support in the references themselves. It is disingenuous and overly simplistic to say that the ability "to examine different specimen characteristics under different light conditions" is desirable – better performance is always desirable. The question is what *reasoning* supports combining the references to produce the invention claimed, and "ability to examine under different conditions" is not reasoning supporting such a combination. This reasoning is tantamount to saying one would be motivated to combine A with B because then you could have A and B. This is not a reason to combine, but a desired end result gleaned from Applicant's claims and the use of hindsight.

As noted above, the PTO has the burden of establishing a prima facie case of obviousness under 35 USC §103. The Patent Office must show that some reason to combine the elements with some rational underpinning that would lead an individual of ordinary skill in the art to combine the relevant teachings of the references. *KSR International Co. v. Teleflex Inc.*, No. 04-1350, 127 S. Ct. 1727 (2007); *In re Fine*, 837 F.2d 1071, 1074 (Fed. Cir. 1988). Therefore, a combination of relevant teachings alone is insufficient grounds to establish obviousness, absent some reason for one of ordinary skill in the art to do so. *Fine* at 1075. In this case, the Examiner has not pointed to any cogent, supportable reason that would lead an artisan of ordinary skill in the art to come up with the claimed invention.

None of the references, alone or in combination, teaches the unique features called for in the claims. It is impermissible hindsight reasoning to pick a feature here and there from among the references to construct a hypothetical combination which obviates the claims.

> It is impermissible, however, simply to engage in a hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps. [*citation omitted*]

In re Gordon, 18 USPQ.2d 1885, 1888 (Fed. Cir. 1991).

A large number of devices may exist in the prior art where, if the prior art be disregarded as to its content, purpose, mode of operation and general context, the several elements claimed by the applicant, if taken individually, may be disclosed. However, the important thing to recognize is that the reason for combining these elements in any way to meet Appellant's claims only becomes obvious, if at all, when considered from hindsight in the light of the application disclosure. The Federal Circuit has stressed that the "decisionmaker must step backward in time and into the shoes worn by a person having ordinary skill in the art when the invention was unknown and just before it was made." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1566 (Fed. Cir. 1987). To do otherwise would be to apply hindsight reconstruction, which has been strongly discouraged by the Federal Circuit. *Id.* at 1568.

> To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

W.L. Gore & Assoc. v. Garlock, Inc., 721 F.2d 1540, 1553 (Fed. Cir. 1983). Therefore, without some reason in the references to combine the cited prior art teachings, with some rational underpinnings for such a reason, the Examiner's conclusory statements in support of the alleged combination fail to establish a prima facie case for obviousness. *See, KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007) (obviousness determination requires looking at "whether there was an apparent reason to combine the known elements in the fashion claimed…", *citing In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere

conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness," KSR at 14).

Simply stating that the invention would have been obvious to a person of ordinary skill is also insufficient, for the assertion must be supported by clear and convincing evidence. *Panduit*, *supra*, 810 F.2d at 1568. The Final Office Action merely states that the invention would be obvious in light of the proposed combination, and does not provide clear and convincing evidence or reasoning to support this assertion.

The Examiner has failed to avoid the effects of hindsight reasoning in fashioning the combination of Chuang and Shafer, presents no reasons having rational underpinnings in support of the combination, and for these further reasons claim 1 is allowable in view of Chuang in view of Shafer. Claims depending from claim 12 and 22 are also allowable as they include limitations not shown in the cited references, either alone or in combination.

C. Claims 1, 2, 5, 70, 75-78, 83, 84, and 86-89 are Patentable Over Liang in view of Shafer '722

The Office Action rejected claims 1, 2, 5, 70, 75-78, 83, 84, and 86-89 under 35 U.S.C. 103 based on Liang, U.S. Patent Publication 2004/0051957 in view of Shafer '722, U.S. Patent Publication 2001/0040722.

Liang illustrates a miniature microscope array (MMA) of specific design having certain magnifications, NAs, outer diameters (ODs) and fields of view (FOVs). The outer diameter of the Liang MMA is said to be "substantially 1.6-2.0 mm or less" (Liang, paragraph [0009]). Several interrelationships between measurements are disclosed, such as FOV values relative to OD and M (magnification) values relative to NA (numerical aperture), and the patent as noted in the Office Action states that the FOV "for the three or four lens designs is preferably substantially 220-240 μm or more." However, while the Liang FOV can, based on the totality of the restrictions presented, be more than 0.240

millimeters[1], the Liang design cannot support or be said to disclose a design having a field of view in excess of approximately 0.400 millimeters as alleged in the Final Office Action, an approximately 66% increase over the supported FOV range spelled out in paragraph [0010] of Liang.

Simply because Liang states that the FOV is "substantially 220-240 μm or more," such an assertion does not support, nor can Liang be said to disclose, a design that shows or anticipates every conceivable design having a field size larger than 240 μm. For example, a design having a 20 meter field of view would not be anticipated by Liang, as Liang shows no such design. This becomes a question of degree: Since Liang does not disclose nor can the reference be said to present a design where field size can be from "substantially 220-240 μm" through infinity, as is apparently alleged in the Office Action, the questions becomes what in fact does Liang disclose with respect to an actual FOV and what FOV can Liang be said to support or anticipate?

A patent is only a reference for what it discloses, not some hypothetical prediction or assertion. A similar situation was examined in *Ortho-McNeil Pharmaceutical, Inc. v. Caraco Pharmaceutical Laboratories, Ltd.*, Appeal 06-1102 (Fed. Cir. January 19, 2007), wherein the phrase "about 1.5" was analyzed. The Federal Circuit noted:

> The use of the word "about," avoids a strict numerical boundary to the specified parameter. Its range must be interpreted in its technological and stylistic context. We thus consider how the term . . . was used in the patent specification, the prosecution history, and other claims. It is appropriate to consider the effects of varying that parameter, for the inventor's intended meaning is relevant. Extrinsic evidence of meaning and usage in the art may be helpful in determining the criticality of the parameter.

[1] It is to be noted that 240 micrometers, the value used in Liang, is 0.240 millimeters, and 0.400 millimeters, the value used in the present claims, is 400 micrometers. Certain values in micrometers and millimeters used in this discussion have been converted to enable comparing "apples to apples."

> *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1217 (Fed. Cir. 1995) (citations omitted). *See also Modine Mfg. Co. v. United States Int'l Trade Comm'n*, 75 F.3d 1545, 1554 (Fed. Cir. 1996) (stating that "the usage [of the term 'about'] can usually be understood in light of the technology embodied by the invention"); *Conopco, Inc. v. May Dep't Stores Co.*, 46 F.3d 1556 (Fed. Cir. 1994) (discussing the criticality of the claimed ratio to the invention and whether or not one of ordinary skill in the art would have read the modifier "about" expansively in light of the intrinsic evidence).

Ortho McNeil at p. 9.[2]

Similarly, use of the phrase "substantially 220-240 μm or more" employed in Liang requires interpretation in view of <u>what was actually intended</u> by the Liang disclosure <u>and what is actually disclosed by the reference</u>, and invites, if not outright requires, a detailed examination of the Liang specification. As noted, interpreting the term to include an infinite or extremely large field of view was obviously not intended by Liang. However, a review at the actual disclosure of Liang does provide insight into the intended meaning by the phrase and the actual FOV of the design.

Liang discusses actual implementation of the design and specifically arrays or rows of objectives at paragraphs [0057]-[0059], which state:

> For microscope array applications that image a large continuous object, it is preferred that FOV gaps between neighboring objectives in a row be covered using additional rows of objectives. The total number of rows is partially determined by the FOV to OD ratio. For example, approximately eight rows correspond to a **FOV-to-OD ratio of 0.15**, in accordance with a particularly preferred embodiment wherein the magnification has a magnitude of about 7. Currently preferred array assembly

> techniques provide for packing the objectives into a hex array. The distances between the rows are 1.5 mm. ...
>
> These 12 rows of objectives correspond to a **FOV-to-OD ratio of about 0.1**, or the number of rows, i.e., 12, times the FOV-to-OD ratio is about 1.2. **The FOV-to-OD ratio has a lower limit of about 0.1 according to a preferred embodiment. The FOV-to-OD ratio is around 0.15** for the preferred embodiment including around 8 rows, or 8 times 0.15=1.2. So, if one desired to tightly pack the 13 rows, then **the lower limit [of FOV-to-OD ratio] may be reduced to about 1.2/13 ~ 0.09**. ...[3]

(emphasis added).

In other words, the actual application of the Liang design corresponds to a FOV-to-OD ratio between "about" 0.09 to "around" 0.15. While many varying magnification to NA formulations are presented, no FOV-to-OD ratio larger than 0.15 is expressly called out in Liang, and no ODs (outside diameters) smaller than 1.6 mm are suggested. No such design having an FOV to OD ratio greater than "around" 0.15 is anywhere described in Liang. Further, no design showing a FOV greater than the "substantially 220-240 μm or more" is shown in Liang, but the maximum FOV appears to be in the cited range or possibly slightly higher based on use of the word "around." However, the field of view cannot be said to be 66 per cent higher based on the language employed in Liang. A FOV of 0.400 mm, recited in all pending claims of the present application, using a Liang OD of greater than 1.6 mm yields a FOV-to-OD ratio of over 0.25, a full 66% increase over the .15 value actually called out as the highest FOV-to-OD numeric value in Liang. Thus in reality no design 66 per cent higher than 240 micrometers FOV is described in or supported by the Liang disclosure. As with a design having a 20 meter or

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[2] The text of the opinion can be found at http://fedcir.gov/opinions/06-1102.pdf
[3] Several relationships are called out in Liang, including some that actually might be thoroughly unusable, including but not limited to relationships between magnification and NA, FOV, magnification and OD, etc., The FOV to OD definition provides the clearest representation of the design and its limitations and actual

infinite FOV that could be misread to fall within the "substantially 220-240 μm or more" wording of Liang, in reality the specification does not support an FOV much larger than the 0.240 millimeters disclosed. Thus Appellants submit that Liang does not disclose nor suggest a design having "a field size in excess of approximately 0.4" (claim 75), or similar language.

Shafer '722 presents an off-axis design that does not conform to the present claims due to the limitation of alignment along a single axis (e.g. claim 75, "comprising a plurality of optical elements all aligned along an axis"; claim 1, "said imaging subsystem comprising a plurality of elements all aligned along a single axis"). Shafer '722 represents a fundamentally different design from Liang and from that presented in the present specification and claimed.

Appellants further submit that there is no reasoning presented that would support a combination of Liang with Shafer, as suggested, present in the references themselves, and it is only through the use of hindsight that such a combination could be made. The law regarding combining references is as stated above with respect to the purported combination of Chuang and Shafer, and in this instance, the reasoning supporting the combination is unfounded. The Final Office Action picks and chooses from among the two references, including noting that (1) Liang does not include an illumination subsystem comprising an arc lamp having the specified wavelength characteristics, (2) Liang lacks the Mangin mirror arrangement or collection of optics for collecting light energy. The Final Office Action locates these significant missing elements in Shafer '722, which shows an off-axis arrangement contrary to the claim language (e.g. claim 75, "comprising a plurality of optical elements all aligned along an axis"; claim 1, "said imaging subsystem comprising a plurality of elements all aligned along a single axis"). Again, Appellants note that a fundamental argument being made in the present case is that one can simply employ certain elements with previously available <u>but materially different objective designs</u> and obtain a functional design having the performance

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intended operation. Failure to meet these clearly articulated FOV to OD ratios and requirements indicate that a design falling short of the express parameters had not been realized by Liang.

parameters claimed. In reality, certain design elements cannot be wholesale incorporated into existing designs and produce a workable completed design, such as an off-axis objective being fundamentally changed to an on-axis objective that produces improved performance characteristics. In reality, the off-axis Shafer '722 design could not be combined with the teachings of Liang to produce a workable design, much less one that conforms to the limitations of the present claims.

The first reasoning for combining Liang with Shafer '722 is "to provide a well known microscope system to investigate samples." Final Office Action, p. 6. This is not a reason to combine references, but instead represents a beneficial result of what the Examiner hopes such a hypothetical combination would accomplish, having no basis in reality. In point of fact, a combination of the teachings of Liang with the teachings of Shafer '722 would produce some type of objective, either on-axis or off axis, that would require a great deal of redesign and experimentation to successfully employ, or would need to be excessively modified to obtain a decent image of a specimen, and such a combination would not produce a design that conforms to the claim limitations. The second reasoning supporting combining Liang with Shafer '722 is "to correct/prevent/ minimize chromatic aberrations." Final Office Action, p. 7. Again, this is a beneficial result, gleaned form the teachings of Appellants that is employed to pick and choose isolated aspects suggested within the cited references. This is not valid reasoning to combine the references, but an after-the-fact effort to cobble certain concepts together in an attempt to deprecate the invention, in essence an improper use of hindsight. Use of hindsight in this manner is improper. For this further reason, claims 1, 75, 83, and 86 and claims depending therefrom are allowable over the cited references.

As none of the cited references disclose systems or methods having all of the limitations recited in the independent claims, as amended, Appellants submit that the claims are not rendered obvious by the references, either alone or in combination. Appellants therefore respectfully submit that independent claims 1, 75, 83 and 86 are allowable over the references of record, as such claims as amended are neither anticipated

nor obvious based on those references. Further, claims depending from claims 1, 75, 83, and 86 are allowable as they depend from an allowable base claim.

Accordingly, it is respectfully submitted that all pending claims fully comply with 35 U.S.C. §§ 102 and 103.

CONCLUSION

In view of the foregoing, Appellants submit that all pending claims are patentably distinct over the prior art and are allowable. Thus the Final Office Action rejecting all pending claims is in error and should be reversed.

Appellants believe that no fees are due in accordance with this Appeal Brief beyond those included herewith. Should any additional fees be due or overpayment made, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment to Deposit Account 502026.

Respectfully submitted,

Date: October 8, 2007

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8. CLAIMS APPENDIX

1. A system for inspecting a specimen, comprising:

an illumination system comprising an arc lamp able to provide light energy having a wavelength in the range of less than approximately 320 nanometers; and

an imaging subsystem oriented and configured to receive said light energy from said illumination system and direct light energy toward said specimen, said imaging subsystem comprising a plurality of elements all aligned along a single axis, each element having diameter less than approximately 100 millimeters, wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90 for the light energy received from the illumination system having the wavelength in the range of less than approximately 320 nanometers.

2. The system of claim 1, wherein said plurality of elements comprises a mangin mirror arrangement.

3. (canceled)

4. (cancelled)

5. The system of claim 1, said plurality of elements comprising collection optics for collecting light energy reflected from said specimen, wherein the collection optics are catadioptric.

6. The system of claim 1 where the imaging and illumination subsystems support at least one of a group of inspection modes comprising bright field, ring dark field, directional dark field, full sky, aerial imaging, confocal, and fluorescence.

7. The system of claim 1 where the imaging subsystem uses a varifocal system for the full magnification range.

8. The system of claim 1 where separate imaging lenses are used for specific magnification increments.

9. The system of claim 1, further comprising a data analysis subsystem for analyzing data representing the light energy reflected from the specimen, wherein the data analysis subsystem has the ability to record defect position for any defect on the specimen.

10. – 69. (canceled)

70. The system of claim 5 where the catadioptric optics support wavelengths from approximately 266 – 600nm.

71. – 74. (canceled)

75. A system for inspecting a specimen, comprising:

an illumination system able to provide light energy having a wavelength within a predetermined range; and

an imaging subsystem oriented and configured to receive said light energy from said illumination system and direct light energy toward said specimen, said imaging subsystem comprising a plurality of optical elements all aligned along an axis and each having maximum diameter less than approximately 100 millimeters, wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90.

76. The system of claim 75, wherein the predetermined range is approximately 285-320 nanometers.

77. The system of claim 75, wherein said plurality of optical elements comprises a mangin mirror arrangement.

78. The system of claim 75, wherein said plurality of optical elements comprises collection optics for collecting light energy reflected from said specimen, wherein the collection optics are catadioptric.

79. The system of claim 75, where the imaging and illumination subsystems support at least one of a group of inspection modes comprising bright field, ring dark field, directional dark field, full sky, aerial imaging, confocal, and fluorescence.

80. The system of claim 75, where the imaging subsystem uses a varifocal system for the full magnification range.

81. The system of claim 75, where separate imaging lenses are used for specific magnification increments.

82. The system of claim 75, further comprising a data analysis subsystem for analyzing data representing the light energy reflected from the specimen, wherein the data analysis subsystem has the ability to record defect position for any defect on the specimen.

83. A system for inspecting a specimen, comprising:

an illumination system able to provide light energy having a wavelength within a predetermined range; and

an imaging subsystem configured to receive said light energy and direct light energy toward said specimen using a plurality of elements having a maximum diameter less than approximately 100 millimeters, said plurality of elements being free of planar reflecting surfaces, wherein the imaging subsystem is configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90.

84. The system of claim 83, wherein said plurality of elements comprises a mangin mirror arrangement.

85. The system of claim 83, further comprising a data analysis subsystem for analyzing data representing the light energy reflected from the specimen, wherein the data analysis subsystem has the ability to record defect position for any defect on the specimen.

86. A method for inspecting a specimen, comprising:

providing light energy having a wavelength within a predetermined range; and

receiving said light energy and directing light energy toward said specimen using a plurality of optical elements aligned collectively along a single axis, each optical element having maximum diameter less than approximately 100 millimeters, wherein the optical elements are configured to provide a field size in excess of approximately 0.4 millimeters at a numerical aperture of approximately 0.90.

87. The method of claim 86, wherein the predetermined range is approximately 285-320 nanometers.

88. The method of claim 86, wherein said plurality of optical elements comprises a mangin mirror arrangement.

89. The method of claim 86, wherein said plurality of optical elements comprises collection optics for collecting light energy reflected from said specimen, wherein the collection optics are catadioptric.

90. The method of claim 86, where providing and receiving and directing supports at least one of a group of inspection modes comprising bright field, ring dark field, directional dark field, full sky, aerial imaging, confocal, and fluorescence.

91. The method of claim 86, further comprising analyzing data representing the light energy reflected from the specimen, wherein analyzing data provides an ability to record defect position for any defect on the specimen.

9. EVIDENCE APPENDIX

None.

10. RELATED PROCEEDINGS APPENDIX

None.